

# AMATEUR SATELLITE REPORT

AMSAT® NA Newsletter for the Amateur Radio Space Program



Amateur Satellite Report is endorsed by the  
American Radio Relay League as the special interest  
Newsletter serving the Amateur Radio Satellite Community

Number 159  
October 12, 1987

Editor: Vern Riportella, WA2LQQ  
Contr. Editors:  
Pete Killingsworth, KD7WZ  
Managing Editor: Bob Myers, W1XT

Copyright 1987 by AMSAT® NA, The Radio Amateur  
Satellite Corporation. AMSAT® is a registered trademark.

## Utah Conference On Small Satellites To Have Strong AMSAT Input

Utah State University is sponsoring a conference on small satellites October 7-9 at the Utah State campus in Logan. Conferencees will hear papers on applications, system concepts, subsystem designs and tradeoffs, mission design and more. The conference is co-sponsored by Utah State University and the Utah Section of the American Institute of Aeronautics and Astronautics (AIAA).

AMSAT members will present at least five papers at the conference. Dick Daniels, W4PUJ, will discuss his work on the Phase 3C propulsion system. Dick Jansson, WD4FAB, will discuss the Phase 4 program. Gordon Hardman, KE3D, will discuss his work on the Phase 3C IHU. Vern Riportella, WA2LQQ, will discuss the emerging small satellite, private sector, user community. Martin Sweeting, G3YJO, will present a paper on UoSAT projects.

Dr. Frank Redd of Utah State is the point of contact for the meeting. He can be reached at 801-750-3554.

This conference comes on the heels of last month's highly successful "Lightsat" conference in Monterey, California. Organizers there had anticipated about 100 attendees and were swamped when more than 800 showed up. World-wide interest in small satellites is burgeoning. AMSAT leaders see this as a mixed blessing. On the one hand, the satellite world is moving to AMSAT's square on the board; a domain in which it has become a recognized expert. On the other hand, there is so much commercial and government activity in the area now, it is difficult to predict how it will all turn out. AMSAT leaders are investigating ways of capitalizing on this interest growth in terms of facilitating long range goals such as Phase 4 and others. The conference in Utah is seen as another opportunity to broaden AMSAT's influence on the evolution of small satellite technology and applications.

## Soviet Space Conference Scheduled On Sputnik Anniversary

Academician Roald Sagdeev, Director of the Soviet Space Research Institute, is heading an international Space Future Forum in Moscow October 2 - 4 according to the September 7 edition of *Aviation Week and Space Technology* magazine. The forum will address the many facets of space activities including implications for society potential for service.

A team of 6 NASA scientists and astronauts will attend according to informed sources. Dr. Carl Sagan of Cornell University is scheduled to speak at the forum.

AMSAT has been invited to participate in support of a Harvard/Boston-based project called *Satellite*, a program originated by Dr. Bernard Lown, co-founder of the 1985 Nobel Peace Prize-winning International Physicians For the Prevention of Nuclear

War. AMSAT would provide technical assistance based on its knowledge of small satellite capabilities and inexpensive ground terminals.

The meeting is timed to coincide with the 30th Anniversary of the launch of the first artificial earth satellite, Sputnik, October 4. Dr. Sagdeev recently appeared in interviews in the widely acclaimed Public Broadcasting System TV documentary, "The Race For Space".

## FO-12 Shows Strongly Polarized Signals Says VHF/UHF Guru

Dick Jansson, WD4FAB, reports FO-12 downlink polarization is very sharply defined. That is, when the satellite is approaching you, one sense of polarization is strongly favored and when its diverging from you the opposite is preferred. When it's overhead, it doesn't matter he says. Many operators, Dick remarks, are using far too much uplink power on FO-12 because they simply can't hear their own downlink. This can be due, he concludes to a strong polarization sense shift from Right Hand Circular Polarization (RHCP) to Left Hand Circular Polarization (LHCP). Thus, you should have the ability to switch between the two to be successful and consistent with FO-12.

## Study Finds Space Station Risk and Cost Up Significantly

According to a just released report, going to the moon was easy when compared with what's ahead for NASA. In a four month study commissioned by the White House, the National Security Council and NASA, the National Research Council (NRC) found that Space Station plans "rank as the most ambitious and lengthy task NASA has ever undertaken." The report goes on to say that in order to build the Space Station, NASA must improve the Space Shuttle's reliability, increase the load carrying capacity of the shuttle, build expendable rockets to help re-supply the space station, and develop systems to allow the shuttle to stay in orbit longer.

The study indicates that orbiting the station will be difficult, risky, and will require a long term commitment by the government, with a series of multi-year appropriations. The Space Station, says the study, "cannot be considered a 'one administration' program nor can it be developed 'on the cheap'."

Dr. Robert C. Seamans, Jr., the study committee Chairman, was quoted as saying that the government and American people "must be willing to make a strong and durable commitment to the program's success." Seamans went on to say that "one of the valuable lessons learned from the Challenger tragedy was the major space programs cannot be developed 'on the cheap', nor can they be subjected to continual budgeting and schedule pressures without disastrous results."

Cost of Phase I of the Space Station program has been pegged by some at over \$14 Billion. Phase I calls for in-orbit construction of a large beam with modules attached at the center and eight solar power arrays at the ends of the beam. The modules would be provided by the United States, Japan and the European Space Agency.

With Senator Proxmire's announced intention to cut the funding for the Orbiting Space Station, NASA had hoped the report would have been more favorable. The NRC did point out, however, they were not chartered to create policy for the country, only comment on the project.

## Short Bursts

- Paul Rinaldo, W4RI, reports the August, 1987 IEEE Journal on Selected Areas of Communications is devoted to low bit rate video papers. The report is available from IEEE Service Center, 445 Hoes Ln, POB 1331, Piscataway, NJ 08855-1331. Many of these papers are esoteric but give some confidence that 64-384 kbit/s video is going to become a commercial reality.
- The new N4HY graphics tracking program, QUIKTRAK version 3.0, is now available through the AMSAT software exchange. The new package produces a detailed map-based tracking system as well as a comprehensive tabular output. It runs on IBM PCs with DOS 3.0 or later and does not require the 8087 math co-processor but will run faster if it's installed. The software commands auto-tracking rotor systems, tunes radios to compensate for Doppler shift and much more. Inquire at AMSAT HQ.
- The Space Shuttle's solid rocket boosters are going to get some competition. NASA has awarded \$2.5 Million contracts to General Dynamics and Martin Marietta to examine pressure-fed and pumped liquid fuel rockets. Each company will develop a "recommended design". After evaluation, NASA will determine if either should be used to replace the current solid propellant boosters now used in the STS program.

## SA AMSAT Conference Attracts Overseas Attendees

George Hunt, 7P8DL, has returned from Canada to Lesotho, southern Africa. George is seeking to establish packet radio networks in southern Africa in conjunction with SA AMSAT under the general leadership of Hans Van de Groenendahl, ZS6AKV. George will be meeting with the Canadian Aid People this week and attend the SA AMSAT Conference on September 26. He plans to deliver a paper there reporting on his activities and plans. Also attending the conference from overseas are James Miller, G3RUH, and Junior De Castro, PY2BJO. The conference is the major meeting of SA AMSAT's annual calendar.

## New Orbital Data System On the Way; Help Needed In Distribution

A new system of orbital data development and distribution is being designed by AMSAT Operations Vice President Ralph Wallio, W0RPK, and Courtney Duncan, N5BF. They will be working to facilitate the conversion of NASA bulletins to AMSAT format and to develop a format that can easily be loaded in computer programs with no manual intervention. In this way individuals may pick up orbital data via satellite distribution, via electronic mail or via packet radio bulletin boards.

Meanwhile, AMSAT is asking all Regional Coordinators, Area Coordinators and members with Keplerian Element computer processing capability to participate in a new push to get usable orbital predictions into the hands of newcomers. So many experienced satellite users now employ computer tracking methods that the use of manual plotters is fast becoming a lost art. For various reasons AMSAT has not recently published satellite equator crossing data. Project OSCAR will no longer be publishing

## CALL FOR PAPERS AMSAT-NA TECHNICAL JOURNAL Volume 1, Number 2

AMSAT-NA Technical Journal made its debut last July. The second issue is being assembled for publication before the end of 1987 and we need contributions for the next issue. There is a particular need for articles related to the Phase 4 project.

Please submit your material both in hardcopy and as a text file on diskette. Any 5 1/4 inch format is acceptable provided the format is clearly indicated on the label. Please be sure that any special character sequences inserted by word processing programs have been deleted from the text file. Any required figures should be carefully drawn at least twice the size they are likely to appear in the final publication. Mail your submissions to: Robert J. Diersing, N5AHD, Editor, AMSAT-NA Technical Journal, Computer Science Department, Corpus Christi State University, 6300 Ocean Drive, Corpus Christi, TX 78412, (512)-991-6819-X476

Contributions may be made by a member of any international AMSAT group. Contributions are also welcomed from persons not affiliated with an AMSAT group but with an interest in the Amateur Radio Space Program. Please also bear in mind that ATJ does contain articles reprinted from other journals as long as there is general technical interest and permission for reprinting can be obtained. If you know of an article that would be appropriate for reprinting in ATJ, please inform the editor at the address above.

The deadline for contributions for the next issue of AMSAT-NA Technical Journal is November 1, 1987.

its orbital data book. Consequently, in order for the rank beginner to find the new satellites, he must buy a computer, obtain the tracking software and learn how to use it. That's a big first step investment for many who aren't even sure they're really that interested in satellites.

To reduce that first step, AMSAT is undertaking to make EQX tracking data as broadly accessible as possible. That's where the experienced folks with computers come in. Take the Keplerian data you receive from AMSAT and develop custom EQX predictions for your locale. Post them to the local packet BBS if possible. Print copies of predictions and hand them out at hamfests and conventions. This technique is usually very successful at encouraging many to listen. Typically they have no idea of how much they could hear with just a plain VHF or HF station. UO-9 and UO-11 can most often be picked up on an HT if one knows when to listen. (The frequency of both is 145.825 MHz.) Moreover, with RS-10/11 now up and running, individuals with only HF equipment can get started using satellites immediately if they have only the manual tracking systems, a little operational guidance and the EQX data.

So this your opportunity to help. Develop equator crossing data for your locale and make that data widely available to area hams. Leave free copies in ham stores, Radio Shack stores and so forth. You might put your phone number on them so those who pick up a copy can reach you if they have questions. You might also care to put AMSAT's address on the handout so the newcomer can obtain free, helpful information.

AMSAT, P.O. Box 27, Washington D.C. 20044 is the address. The phone number is 301-589-6062.

## **Ariane Launch Success Places Phase 3C On Six Month Countdown**

The European Space Agency (ESA) is back among the organizations with active satellite launch capability. Sixteen months of recovery efforts were capped in a few dramatic seconds on September 16. An Ariane-3 rocket quickly lifted off the darkened pad in Kourou, French Guiana, and soon placed two new communications satellites in their transfer orbits. The successful launch was the first since a May, 1986 disaster shut down ESA's access to space.

The Ariane-3 is an enhanced version of the Ariane-1. It was an Ariane-1 which placed AO-10 in orbit in 1983. The addition of two strap-on solid boosters gives the Ariane-3 an added payload capability compared to the Ariane-1. The Ariane-3 can place two 1200 kg satellites in geosynchronous transfer orbit (GTO) compared to a total payload of 1750 kg for the Ariane-1.

The ignition of the solid boosters about 1 second after the liquids were ignited provided a sudden, brilliant flash which further lit up the darkened jungle around the coastal launch site. For a fleeting moment one thought the worst had befallen the launch. But up through the clouds the mighty chariot rose undaunted by the fiery plume on which it rode.

Compared to the slow, deliberate ascent of the Ariane-1 with its liquid propellant first stage, the ignition of the solids on Ariane-3 seemed to catapult the launcher into the overhanging cloud cover as if ejected from a giant cannon. The Ariane-4 on which AMSAT's Phase 3C will be launched is similar to the Ariane-3 except its first stage will employ improved strap-on solids or liquid strap-ons or a combination of both.

The satellites placed in GTO by this, the V-19 launch, were Eutelsat's European Communications Satellite #4 (ECS-4) and the Australian Aussat K3. Both were precisely deposited in their GTO according to plan.

The launch came during AMSAT's 75 meter East Coast net on Tuesday evening, (00:45:28 Wednesday, UTC). Listeners to the net were treated to live coverage as NCS WA2LQQ recounted the action relayed through a commercial satellite link from Kourou. Other AMSAT members also watched the launch on their home TVRO systems. Originally scheduled for earlier in the evening, the launch slipped into net time because of a faulty pressure transducer indication. It was decided to ignore the indication after it was confirmed by other means that there was no real fault. The launch came within two minutes of the launch window's closing.

AMSAT's Phase 3C will ride the V-22 launch nominally scheduled for January, 1988. This success-oriented schedule assumes a launch about every 6 weeks. AMSAT believes a March date is more realistic for V-22 but is preparing for the January date nevertheless. The Phase 3C Launch Campaign was officially inaugurated upon the V-19 success.

## **Phase 3C Computer Ready For Integration With Spacecraft**

The Phase 3C IHU (Integrated Housekeeping Unit) has been buttoned up and shipped to AMSAT DL for integration in the spacecraft. Final assembly and test were performed recently by Gordon Hardman, KE3D, in Colorado. The Phase 3C IHU employs an improved design which will preclude recurrence of the malfunction which has overtaken AMSAT OSCAR 10, IHU memory failure due to accumulated radiation exposure.

The new IHU memory uses very rugged, radiation hardened CMOS integrated circuits made and supplied by Harris Custom Integrated Circuit Division, Melbourne Florida. The Harris HS6564-RH chips are at least 100 times more resistant to radiation damage than the specially modified NMOS memory flown on AO-10. If AMSAT had to purchase the new memory, it would have cost around \$100,000. But thanks to some fine work by Harold Winard, KB2M, and the marketing folks at Harris, a donation of these invaluable components was arranged. They assure Phase 3C's IHU will survive well beyond the 7 to 10 year life expected from the spacecraft.

The new IHU memory construction was completed by KE3D earlier this year but required some final touch-up prior to shipment. Gordon says the timing margins on the entire IHU are excellent and the unit works perfectly. Launch of Phase 3C is now pegged at late winter or early spring, 1988.

The Phase 3C spacecraft will employ 4 transponders: Modes B, JL and RUDAK (built by AMSAT DL) and Mode S built by AMSAT-NA.

## **New Regional Coordinator and NCS Appointed**

AMSAT has announced two major appointments to its leadership corps. In the Field Operations group, John Fail, KL7GRF, has been appointed Regional Coordinator. John will be responsible for California and Nevada. He joins more than a dozen Regional Coordinators overseeing the Area Coordinator team of more than a hundred. John will report to Acting Field Operations VP Doug Loughmiller, KO5I. The Field Operations group has primary responsibility for conventions, hamfests, club presentations and so forth. They provide the interface between the general Amateur Radio community and AMSAT and between the general public and AMSAT.

In the second appointment, John Gayman, WA3WBU, has been appointed Net Control Station (NCS) for the 75 meter East Coast net. John replaces Vern Riportella, WA2LQQ, who retires after 7 years as NCS. John is from Marysville, Pennsylvania and is a long-time satellite user. He joins nearly 2 dozen other official NCSs in bringing the AMSAT News Service bulletins to the Amateur Radio community and reports to Net Manager, Wray Dudley, W8GQW.

AMSAT congratulates the new appointees.

## **AMSAT Seeks Help With Video Productions**

AMSAT is looking for volunteers for an important new project. Several individuals and groups have suggested an AMSAT video tape production project to provide educational and documentary material on AMSAT. AMSAT has several video professionals already at work and wants to team them with others in the field to establish a cohesive, effective team. Tom Larson, N1CHM, manages the AMSAT Videotape Library and Jeff Kelly, KT2K, manages a professional industrial video production facility. AMSAT is seeking additional team members to begin at once several projects aimed at the several objectives mentioned. Persons with experience in direction, script writing, illustration, editing and associated arts are sought. Contact AMSAT President WA2LQQ via AMSAT HQ if you can help.

## **FO-12 Operating Schedule Scrubbed, Then Re-Instated**

Japanese satellite controllers scrubbed the Fuji OSCAR 12 operating schedule on or about September 7. Sketchy information reaching AMSAT suggests battery charge levels were sinking. This was in turn attributed to eclipses and heavy usage. JARL and JAMSAT are thought to be re-computing the operating schedule. Bob McGwier, N4HY, developed a detailed eclipse schedule to assist in developing a new operating schedule. By late in the week of September 13 there were indications FO-12 was being commanded to the schedule originally distributed. There has been, however, no official word received by AMSAT indicating future plans.

FO-12 operations have been hampered by a number of factors since its August 1986 launch. Some of the apparent problems are technical while others appear to be organizational. The satellite was built by a team comprising JARL (Japanese Amateur Radio League), JAMSAT (Japan AMSAT), NEC (Nippon Electric Company) and NASDA (National Space Development Agency). FO-12,

formerly known as JAS-1, is now under the operational control of JARL. This is the first satellite project for which it has had total operational control. Meanwhile, JAMSAT, which had previously contributed to several OSCAR projects including the Mode J transponder on AO-8, has been called upon to help with the Mode JD software development.

The technical issues involve a chronic power shortage due, in general, to the on-board electronics being more power hungry than expected. With less than expected total power generation, FO-12 has consequently been forced to operating on about a 50% duty cycle.

The organizational problems apparently focus on getting the two principal team players (JARL and JAMSAT) to mesh well together. To a user community interested in seeing FO-12 reach its full operational potential, the main issue is the development and maintenance of a tenable operating schedule offering a good balance of service between Modes JA and JD. All hope the tremendous technical achievement symbolized by FO-12 will be capped by many years of highly productive space operations.

## Kettering and Royal Greenwich Observatory On Line With AMSAT

A new addition to AMSAT's network of space specialists now includes Geoff Perry, founder of the Kettering Space Observer Group and his colleague, Max White of the Royal Greenwich Observatory both in England. Both specialize in satellite observation. Perry in particular is widely quoted on his observations of the Soviet space program as well as that of the U.S.

Recently, for example, Perry, who appears in ASR # 158, said a new Chinese satellite was launched on September 9. The satellite was in a low earth orbit inclined 62 degrees. It was emitting signals on 179.985 MHz. Unfortunately, that frequency falls within U.S. TV broadcast channel 7 making it very difficult to hear. Never-

theless, John Biro, K1KSY, reported he heard the satellite, designated China 21, over New England.

According to the Kettering Group, China 21 was recovered at 0455UTC on 17 September after an 8 day flight, the longest yet in the program. Passes heard over UK at 0440 UTC indicated normal telemetry. Then passes at 0608 UTC and 0745 UTC indicated a spin rate of 100 rpm suggesting the bus had separated from the return capsule. It is expected the bus will continue transmitting for a few more days on 179.985 and 393.670 MHz.

## More About the AMSAT/TAPR DSP Project

AMSAT and TAPR are involved in a project to bring Digital Signal Processing (DSP) to Amateur Radio. One of the priority projects of activity leaders is the development of a BPSK modem. BPSK (Bi-Phase Shift keying) is used on AO-10 and will be used on Phase 3C. Now Drs. Tom Clark, W3IWI, and Bob McGwier, N4HY, have found a way to make common FSK modems such as those used with packet TNCs work with BPSK.

Bob recently demonstrated the concept using his TNC-2 FSK modem to demodulate the FO-12 Mode JD PSK downlink based on a clever trick proposed by Tom. Since the DSP boards remain expensive, Bob is not proposing they be used in place of inexpensive modems such as the TAPR FO-12 modem featured in the September QEX magazine. Rather, Bob's demonstration illustrates the remarkable versatility of DSP techniques. He points out that with a very simple software change involving just two numbers, the user can change his DSP-modem from a PSK demodulator useful for FO-12 and Phase 3C to an FSK modem usable on UO-9 and UO-11. Other applications are on the way and an experimenters team of AMSAT and TAPR members is now forming. The experimenter's boards plug into IBM PCs and clones and will cost about \$525, Bob said.

# AMSAT® NA

**The Radio Amateur Satellite Corporation**

Post Office Box 27  
Washington, DC 20044  
(301) 589-6062

**Non-Profit  
Organization  
Second Class  
POSTAGE PAID  
at  
Waterbury, Conn.**



Decals proclaiming your pride in AMSAT membership are now available from AMSAT. Check with HQ today.

LM-1096 KA6M 99.81  
MAGNUSKI, HANK  
2019 BARBARA DR.  
PALO ALTO CA 94303

**Amateur Satellite Report** (ISSN 0889-6089) is published biweekly for \$16 (inseparable from annual membership dues of \$24) by AMSAT, Post Office Box 27, Washington, DC 20044. Second class postage paid at Silver Spring, MD and additional mailing offices. POSTMASTER: send address changes to *Amateur Satellite Report*, Post Office Box 27, Washington, DC 20044.